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Catch-at-Age of Northwest Atlantic Harp Seals, 1952-1999.

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Abstract

Information on catch levels and the age structure of the catch (catch-at-age) is necessary for accurate population estimation and responsible management of the harp seal (Phoca groenlandica) in the Northwest Atlantic. Harp seals are hunted off southern Labrador and the northeast coast of Newfoundland ('the Front'), in the Gulf of St. Lawrence ('the Gulf'), along west and southeast Greenland, and the eastern Canadian Arctic. This report summarizes available harp seal catch and catch-at-age statistics from 1952 to 1999 for each of these areas. Between 1952 and 1971, catches taken at the Front and Gulf averaged in excess of 288,000 seals. Between the introduction of quotas in 1972 and the demise of the large vessel hunt in 1982, an average of 165,000 seals were taken annually. Catches decreased after 1982 and remained low, averaging approximately 52,000, until 1995. Annual catches again increased to over 240,000 between 1996 and 1999. Prior to 1980, catches in Greenland were consistently less than 20,000 animals. Data collected since 1980 suggest that Greenland catch increased steadily until 1996, declined slightly in 1997 but increased again in 1998 to approximately 89,000. Based on the first nine months of 1999, catches have continued to increase to over 100,000 harp seals. Limited data are available from the Canadian Arctic. However, current catch levels are assumed to be relatively small (<5,000). The age composition of catches at the Front and in the Gulf were estimated based on reported numbers of pups taken and biological sampling of seals one year of age and older (1+) taken from the commercial harvest and research samples. Estimates of the age composition of seals harvested in Greenland were obtained from biological samples collected in West Greenland between 1970 and 1993. The use of this age structure to represent the ages of seals taken in the current Greenland harvest is consistent with lengths obtained during recent sampling in Greenland.

Résumé

Il est nécessaire de disposer de renseignements sur les niveaux de capture et la structure des âges des captures (captures selon l'âge) pour procéder à une estimation exacte et à une gestion responsable du phoque du Groenland (Phoca groenlandica) de l'Atlantique nord-ouest. Cette espèce est chassée au large de la côte du sud Labrador et de la côte nord-est de Terre-Neuve (le « Front »), dans le golfe du Saint-Laurent (le « Golfe »), le long des côtes ouest et sud-est du Groenland et dans l'est de l'Arctique canadien. On trouve dans le présent rapport un résumé des statistiques sur les captures et les captures selon l'âge du phoque du Groenland pour la période 1952 à 1999 et chacune de ces zones. De 1952 à 1971, les captures réalisées sur le Front et dans le Golfe se sont élevées en moyenne à plus de 288 000 individus. La moyenne annuelle a chuté à 165 000 phoques au cours de la période allant de l'imposition de quotas, en 1972, à l'interdiction de la chasse à partir de gros bateaux, en 1982. Les captures ont diminué après 1982 et sont demeurées faibles, la moyenne se situant à 52 000 individus environ jusqu'en 1995. Elles ont ensuite augmenté de

1996 à 1999 pour atteindre une moyenne de plus de 240 000 individus. Avant 1980, les captures du Groenland étaient presque toujours inférieures à 20 000 animaux. Les données obtenues depuis 1980 indiquent qu'elles ont augmenté de façon constante jusqu'en 1996, légèrement fléchi en 1997, mais augmenté de nouveau en 1998 pour atteindre 89 000 individus environ. Selon les données des neuf premiers mois de 1999, les captures ont continué de s'accroître et dépassé les 100 000 individus. Les données pour l'Arctique canadien sont limitées. On suppose cependant que les captures actuelles sont relativement faibles (<5 000). La composition selon l'âge des captures faites sur le Front et dans le Golfe a été estimée à partir du nombre de jeunes abattus signalé et d'échantillonnages biologiques de phoques d'un an ou plus (1+) faisant partie de la récolte commerciale et d'échantillons de recherche. Des estimations de la composition par âges des phoques au Groenland ont été obtenues à partir d'échantillons biologiques recueillis à l'ouest du Groenland de 1970 à 1993. L'utilisation de cette structure des âges pour représenter l'âge des phoques abattus par la chasse actuelle du Groenland est cohérente avec les longueurs obtenues au moment d'un échantillonnage récemment effectué au Groenland.

Introduction

Information on catch levels and the age structure of the harvest (catch-at-age) is required for accurate population estimates of any exploited population. This information, in turn, is needed to develop a responsible management plan for such a population. Although the Northwest Atlantic harp seal (*Phoca groenlandica,* or *Pagophilus groenlandicus*) population has been harvested commercially since the late 1700s, little was known about the age structure of the harvest for most of this period. Lett and Benjaminsen (1977) presented the first comprehensive age structure of the harvest for the period from 1952-75. Subsequently, inconsistencies in the data were corrected and updated estimates are provided in Bowen (1982) and Sjare *et al.* (1996) for the periods up to 1980 and 1993, respectively.

In a review of catches from the Northwest Atlantic, the Joint ICES/NAFO Working Group on Harp and Hooded Seals (Anon. 1998, 1999) presented revised estimates for catches in Greenland indicating that harvests have increased steadily since 1975 and were much higher than previously assumed since the late 1980s. The Working Group also noted that catches in Canada have increased dramatically since 1996 (Anon. 1998, 1999). Stenson *et al.* (1999a) reviewed the available catch data updated to 1998, including the revised estimates of Greenland catches.

It is vital to update catch information so that the harp seal population model (Shelton *et al.* 1996, Stenson *et al.* 1999b, Healey *et al.* 2000) can accurately assess the current status of Northwest Atlantic harp seals. The objective of this study is to review the previously presented data and to update the estimates of catch at age to 1999. Several data sources that were previously unused are

included in calculating catch-at-age, yielding results which change catch estimates for previous years. We also estimate catches for periods where data are lacking.

Data and Discussion

Harp Seal Catches

Harp seals are hunted in three main areas of the Northwest Atlantic. Traditionally, the largest catches have occurred during the winter months in southern Canadian waters near the whelping areas off southern Labrador and/or the Northeast coast of Newfoundland ('the Front' - NAFO Div. 2J and 3KL), and in the Gulf of St. Lawrence ('the Gulf' - NAFO Div. 4STVn). However, this population is also harvested off western and southeastern Greenland (NAFO Div. 1A-F; ICES Area XIVb), and the eastern Canadian Arctic (primarily in the vicinity of Baffin Island). Reported catches for each of these areas are summarized in Table 1 and illustrated in Fig 1.

Front and Gulf

Total catch at the Front and in the Gulf for the years 1952-78 were compiled from values reported in the Statistical Bulletin of the International Commission for Northwest Atlantic Fisheries (ICNAF 1970-77). Subsequent corrections were noted (ICNAF Statistical Bulletins 1985a, b). Total catches for the years 1979-89 were compiled from values reported in the Statistical Bulletin of the Northwest Atlantic Fisheries Organization (NAFO 1984-94). Total catches at the Front and in the Gulf for the years 1989-99 were provided by DFO Statistics Branch. DFO research catches from both Newfoundland and the Gulf were added to the reported catches. As a result, the catches reported here may differ slightly from those summarized by the Joint ICES/NAFO Working Group on Harp and Hooded Seals (Anon. 1998, 1999).

Prior to the imposition of quotas in 1972, catches at the Front and in the Gulf were highly variable, ranging from 188,000 – 389,000 (average 288,000; SD=52,700; Table 1). Between 1972 and 1982, the varying total allowable catch (TAC) (Anon. 1999) resulted in an average catch of 166,000 (SD=21,300; range 124,000 – 202,000) over this period. From 1983-95, catches were reduced (average 52,000; SD=21,300; range 19,000 – 94,000). In 1996, however, catches increased significantly (243,000) and continued to increase until 1998 (283,000). In 1999 catches were reduced slightly (245,000). An average of 259,000 (SD=18,700) seals have been taken annually since 1996.

Greenland

Greenland catches for the years 1952 and 1953 were taken from Bowen (1982) and for 1954-96 from Anon. (1999). In addition, reported catches for 1997, 1998 and the first nine months of 1999 have recently become available. (A. Rosing-Asvid, pers. comm., Greenland Institute of Natural Resources, Nuuk, Greenland). The Joint ICES/NAFO Working Group on Harp and Hooded Seals (Anon. 1998) examined the issue of stock identity of the Greenland harvest and concluded that all catches from west Greenland, and half of the catch from south-east Greenland should be considered to have come from the Northwest Atlantic harp seal stock. The Greenland catches presented in Table 1 reflect this allocation.

Since the late 19th century catch statistics for Greenland were obtained through a reporting system known as the "Hunters' List-of-Game" (Kapel and Rosing-Asvid 1996). However, in 1987 this reporting system was discontinued. In 1993 a new reporting system (known as "Pininarneq") began and has provided estimates of catches from 1993-98. No catch statistics are available in the time period for which there was no reporting system (1988-92) or for 1999. Kapel and Rosing-Asvid (1996) and Rosing-Asvid (1997) compared the two systems of reporting and concluded that they provided comparable data on catches. The latter study corrected reported catches from 1975-95 due to under-reporting in some communities and among part-time hunters. Adjustments to catches prior to 1975 were not applied since under-reporting was considered to be insignificant for this time period (Rosing-Asvid 1997). Corrected estimates of Greenland catches were summarized by the Joint ICES/NAFO Working Group on Harp and Hooded Seals (Anon. 1998, Table 9b).

Reported catches varied from 4,000 – 19,000 (average 10,000; SD=4,000) prior to 1975 with generally slightly higher catches in the 1950s than in the 1960s and early 1970s. From the mid 1970s up to 1996, catches increased relatively consistently from approximately 7,000 in 1975 to 74,000 in 1996. Reported catches declined slightly in 1997 (69,000) but increased again in 1998 to over 81,000. Based on the proportion of catches taken in the first nine months of 1997 and 1998, the total annual catch for 1999 was estimated to be approximately 94,000.

The 1996 harvest reported in Anon. (1999), and the 1997 - 1999 catches presented here have not been adjusted for non-reporting. In order to make it comparable to other estimates, we applied the average correction (9.98%) observed between 1994 and 1995. This raised the reported catch of Northwest Atlantic harp seals in 1996, 1997, 1998 and 1999 to 81,625, 76,386, 89,147 and 103,707 respectively (Table 1).

As noted, no catch statistics are available for 1988-92. Catches were estimated by linear interpolation using the corrected catch totals in 1987 and 1993 as 'endpoints'. The predicted corrected catch values are presented in Table 1.

Prior to 1982, Greenland catches accounted for less than 10% of the total harvest in the Northwest Atlantic. However, with the increased catches in Greenland and decreased Canadian catches, Greenland accounted for almost half of the total reported annual catch in most years between 1984 and 1995. With the increased Canadian catches since 1996, Greenland catches now account for approximately 20-30% of the reported catch.

Canadian Arctic

Catches of harp seals in the Canadian Arctic have not been well documented. The values used here are based upon estimates provided in Bowen (1982) and Roff and Bowen (1986) (Table 1). Bowen (1982) estimated an average annual catch (1,784) for the period 1952-77 by averaging a reported catch of 1,768 seals per year during 1962-71 (Smith and Taylor 1977) and annual estimates for 1974-77 provided by D. Sergeant (pers. comm., DFO Ste. Anne de Bellevue, PQ, Canada). Roff and Bowen (1986) reported annual catches for the period 1978-82 provided by D. Goodman (pers. comm., DFO Science Branch, Ottawa, ON Canada).

The magnitude of the Arctic harp seal harvest since 1983 is unknown. Therefore, the estimated catch in 1982 is assumed to apply to all years since then (Table 1). Recently, the Nunavut Wildlife Board initiated a study of marine mammal harvests on Baffin Island, the area in which the majority of harp seals are taken (Stewart et al. 1986), but the results have not been released. If these results become available, we will be able to update our estimates of recent catches in the Canadian Arctic.

Age Composition of Catches

Determining the age composition of the harp seal catches is extremely difficult (Bowen *et al.* 1983). In particular, it is difficult to obtain sufficient samples that are representative of the different areas, types of hunt (large vessel, landsmen, subsistence, etc.) and harvesting practices (shot, netted, etc.), all of which have changed significantly since 1952. In addition, the process of age determination is not without error (e.g. Doubleday and Bowen 1983) although we do not consider such errors at this time.

Due to the limited commercial hunts during the 1980s and early 1990s and reduced funding for marine mammal research in recent years, appropriate biological samples have been more difficult to obtain. Furthermore, during

periods of reduced sampling animals are often collected for other reasons (e.g. reproductive rates) that could introduce potential biases into the age composition. However, age composition data are generally available for most years from southern Canadian waters (primarily the Front region) while periodic sampling has occurred in Greenland. Very little data on the age structure of catches in the Canadian Arctic are available.

Front and Gulf

The age structures of catches during the 1952-84 period are given in Bowen (1982) and Roff and Bowen (1986). The age structures for the period 1952 to 1983 used in this study are taken from these sources. For the period 1984-1999, the age structure of seals harvested was estimated in the same manner as Bowen (1982), Roff and Bowen (1986) and Sjare et al. (1996). The catch statistics provided by ICNAF, NAFO and DFO Statistical Branch are reported according to pelage type. Based upon these reports, Front and Gulf catches can be split into young of the year (age class 0) and seals one year of age and greater (1+) (see Table 1). The numbers of 0 age-class seals taken annually were obtained directly from these data.

The proportion of 1+ animals (1 year of age and older) in the catch was estimated on an annual basis based upon biological samples collected primarily in Newfoundland and the northern Gulf. Most of these samples were obtained from commercial sealers distributed throughout Newfoundland and Labrador who were requested to retain some or all of their harvest for sampling. Additional samples were obtained from research sampling programs conducted by DFO personnel during which seals were collected for biological samples. In the later case, animals were taken during the late winter or spring moult in a manner similar to the commercial hunt. Samples obtained as a by-catch and seals taken during the month of March (whelping period) have been excluded due to potential biases in the age ratios. Samples obtained by collectors who exceeded their quotas and sub-sampled thes catch were also excluded.

The majority of samples obtained from sealers came from hunters operating small boats. In recent years a greater proportion of samples have been obtained during the longliner hunt, reflecting the increasing importance of this component of the harvest.

Using these data, an updated and thoroughly reviewed database has been used to calculate the proportions-at-age for 1+ animals since 1984 - 1998 (Table 2). The average proportion of 1+ animals harvested during the recent period of increased hunting (1996-1998) as used to estimate the proportion of 1+ animals taken in 1999. The estimated number of seals in each age class caught in the Front and Gulf region from 1952-99 are given in Table 3.

During the 1950s and early 1960s the proportion of young (age class 0) in the catch ranged from 47% to 89%, although in most years young made up 60-80% of the catch (Fig. 2). From 1963-83 young accounted for over 78% of the catch in practically every year. The majority of these young were whitecoats taken during the large vessel hunt on the whelping concentrations.

With a prohibition in the taking of whitecoat harp seals, the hunt shifted towards older seals and young that had completed their first moult ('beaters'). The proportion of young in the catch remained relatively high (70-80%) during the mid to late 80s but was reduced to 40 – 60% during the first half of the 1990s (Table 2, Fig 2). Young of the year accounted for less than 52% of the catch in 1994 and 1995. The increased catches in recent years however, have been directed towards young of the year harp seals. The proportion of young in the catch jumped to over 75% of the total in 1996 and has continued to rise. In 1999 over 97% was reported to belong to age class 0.

Greenland

Previous catch-at-age estimates of harp seals taken in Greenland were given in Bowen (1982) and Roff and Bowen (1986). Because there was no additional data, Sjare *et al.* (1996) calculated a weighted average for each age class, based on catch-at-age frequencies reported for 1978-80 in Roff and Bowen (1986) to the total catch statistics for the years 1984-94, inclusive.

Recently, Kapel (1999) summarised the age structure of harp seals sampled in west Greenland between 1970 and 1993. With the exception of 1981, annual estimates of the age composition of catches are available between 1970 and 1983. Although data were also available for most years from 1984-93, sample sizes were small and often collected for purposes other than age composition (Kapel 1999).

In this study we have taken the age structure of the Greenland harvest from Stenson *et al.* (1999a, Table 4). They estimated the age structure of seals caught in Greenland from 1952 – 1998 using the data presented in Bowen (1982) and Kapel (1999). The age composition of catches presented in Bowen (1982) were used for the 1952-62 and 1963-69 periods while the annual age structures presented in Kapel (1999) were applied to the annual catches for the period 1970-83. The 1981 age structure was assumed to be the same as 1980. Because of the difficulties identified in using the 1984-93 samples on an annual basis, they combined all samples from central and northwest Greenland over the 1984-91 to estimate an average age composition. Similarly, they combined samples from southwest Greenland between 1986 and 1993. An average of these two samples was then applied to the total catches from 1984-99 (Table 4).

The estimated numbers of seals taken in each age class by Greenland hunters from 1952-99 are given in Table 5. Catches in Greenland have traditionally consisted mostly of young of the year although a greater proportion of older animals were taken than in Front and Gulf waters (Fig. 3). Prior to the late 1970s, young of the year seals accounted for 50-60% of the total catches. Since that time the proportion of young has gradually decreased and based on samples collected between 1984-93 (Kapel 1999), less than 15% of the harvest consisted of young of the year. This trend is supported by comments from hunters included in the harvest reports which indicate that the proportion of adults in the catch increased from 10 – 20% in the late 1970s and early 1980s to approximately 50% since 1993 (Anon. 1999). Length data from harp seals caught in Greenland between 1997 and 1999 (Rosing-Asvid, pers. comm, Fig. 4) also suggests that the proportion of 1+ seals (>~115 cm, D. Chabot, pers. comm) taken has remained high.

Canadian Arctic

As there are no recent reports of Arctic harp seal catch-at-age frequencies, we assumed that recent catches have remained at the proportions reported by Roff and Bowen (1986) (Table 6). The estimated numbers of Northwest Atlantic harp seals in each age class are given in Table 7.

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Table 1. Summary of harp seal catches in the Northwest Atlantic, 1952-99. Estimated values are shaded.

	Front and Gulf			Canadian Arctic			Greenland			Total Northwest Atlantic		
Year	0	1+	All	0	1+	All	0	1+	All	0	1+	All
1952	198,063	109,045	307,108	60	1,724	1,784	9,676	6,724	16,400	207,799	117,493	325,292
1953	197,975	74,911	272,886	60	1,724	1,784	9,676	6,724	16,400	207,711	83,359	291,070
1954	175,034	89,382	264,416	60	1,724	1,784	11,299	7,852	19,150	186,393	98,958	285,350
1955	252,297	81,072	333,369	60	1,724	1,784	9,165	6,369	15,534	261,522	89,165	350,687
1956	341,397	48,013	389,410	60	1,724	1,784	6,474	4,499	10,973	347,931	54,236	402,167
1957	165,438	80,042	245,480	60	1,724	1,784	7,602	5,282	12,884	173,100	87,048	260,148
1958	140,996	156,790	297,786	60	1,724	1,784	9,962	6,923	16,885	151,018	165,437	316,455
1959	238,832	81,302	320,134	60	1,724	1,784	5,268	3,660	8,928	244,160	86,686	330,846
1960	156,168	121,182	277,350	60	1,724	1,784	9,531	6,623	16,154	165,759	129,529	295,288
1961	168,819	19,047	187,866	60	1,724	1,784	7,078	4,918	11,996	175,957	25,689	201,646
1962	207,088	112,901	319,989	60	1,724	1,784	5,015	3,485	8,500	212,163	118,110	330,273
1963	270,419	71,623	342,042	60	1,724	1,784	5,864	4,247	10,111	276,343	77,594	353,937
1964	266,382	75,281	341,663	60	1,724	1,784	5,338	3,865	9,203	271,780	80,870	352,650
1965	182,758	51,495	234,253	60	1,724	1,784	5,388	3,901	9,289	188,206	57,120	245,326
1966	251,135	72,004	323,139	60	1,724	1,784	4,093	2,964	7,057	255,288	76,692	331,980
1967	277,750	56,606	334,356	60	1,724	1,784	2,460	1,782	4,242	280,270	60,112	340,382
1968	156,458	36,238	192,696	60	1,724	1,784	4,127	2,989	7,116	160,645	40,951	201,596
1969	233,340	55,472	288,812	60	1,724	1,784	3,734	2,704	6,438	237,134	59,900	297,034
1970	217,431	40,064	257,495	60	1,724	1,784	3,310	2,959	6,269	220,801	44,747	265,548
1971	210,579	20,387	230,966	60	1,724	1,784	3,502	2,070	5,572	214,141	24,181	238,322
1972	116,810	13,073	129,883	60	1,724	1,784	3,431	2,563	5,994	120,301	17,360	137,661
1973	98,335	25,497	123,832	60	1,724	1,784	5,091	4,121	9,212	103,486	31,342	134,828
1974	114,825	32,810	147,635	60	1,724	1,784	4,597	2,548	7,145	119,482	37,082	156,564
1975	140,638	33,725	174,363	60	1,724	1,784	4,165	2,587	6,752	144,863	38,036	182,899
1976	132,085	32,917	165,002	60	1,724	1,784	7,209	4,747	11,956	139,354	39,388	178,742
1977	126,982	28,161	155,143	60	1,724	1,784	9,899	2,967	12,866	136,941	32,852	169,793
1978	116,190	45,533	161,723	72	2,057	2,129	6,981	9,657	16,638	123,243	57,247	180,490
1979	132,458	28,083	160,541	128	3,492	3,620	8,841	8,703	17,545	141,427	40,278	181,706
1980	132,421	37,105	169,526	215	6,135	6,350	4,022	11,233	15,255	136,658	54,473	191,131
1981	178,394	23,775	202,169	158	4,514	4,672	6,057	16,916	22,974	184,609	45,205	229,815
1982	145,274	21,465	166,739	166	4,715	4,881	8,280	18,647	26,927	153,720	44,827	198,547
1983	50,058	7,831	57,889	166	4,715	4,881	6,759	18,025	24,785	56,983	30,571	87,555
1984	23,922	7,622	31,544	166	4,715	4,881	3,686	22,142	25,829	27,774	34,479	62,254
1985	13,334	5,701	19,035	166	4,715	4,881	2,966	17,819	20,785	16,466	28,235	44,701
1986	21,888	4,046	25,934	166	4,715	4,881	3,725	22,374	26,099	25,779	31,135	56,914
1987	36,350	10,446	46,796	166	4,715	4,881	5,403	32,456	37,859	41,919	47,617	89,536
1988	66,972	27,074	94,046	166	4,715	4,881	5,768	34,647	40,415	72,906	66,436	139,342
1989	56,346	8,958	65,304	166	4,715	4,881	6,133	36,838	42,971	62,645	50,511	113,156
1990	34,402	25,760	60,162	166	4,715	4,881	6,498	39,029	45,526	41,066	69,504	110,569
1991	42,382	10,206	52,588	166	4,715	4,881	6,862	41,220	48,082	49,410	56,141	105,551
1992	43,866	24,802	68,668	166	4,715	4,881	7,227	43,411	50,638	51,259	72,928	124,187
1993	16,401	10,602	27,003	166	4,715	4,881	7,592	45,602	53,194	24,159	60,919	85,078
1994	25,223	36,156	61,379	166	4,715	4,881	8,518	51,166	59,684	33,907	92,037	125,944
1995	34,106	31,661	65,767	166	4,715	4,881	9,462	56,835	66,298	43,734	93,211	136,946
1996	184,856	58,050	242,906	166	4,715	4,881	11,650	69,976	81,626	196,672	132,741	329,413
1997	220,476	43,734	264,210	166	4,715	4,881	10,902	65,484	76,386	231,544	113,933	345,477
1998	251,403	31,221	282,624	166	4,715	4,881	12,723	76,424	89,147	264,292	112,360	376,652
1999	237,783	6,769	244,552	166	4,715	4,881	14,801	88,906	103,707	252,750	100,390	353,140

Table 1. Summary of harp seal catches in the Northwest Atlantic, 1952-99. Estimated values are shaded.

	Front and Gulf			Canadian Arctic			Greenland			Total Northwest Atlantic		
Year	0	1+	All	0	1+	All	0	1+	All	0	1+	All
1952	198,063	109,045	307,108	60	1,724	1,784	9,676	6,724	16,400	207,799	117,493	325,292
1953	197,975	74,911	272,886	60	1,724	1,784	9,676	6,724	16,400	207,711	83,359	291,070
1954	175,034	89,382	264,416	60	1,724	1,784	11,299	7,852	19,150	186,393	98,958	285,350
1955	252,297	81,072	333,369	60	1,724	1,784	9,165	6,369	15,534	261,522	89,165	350,687
1956	341,397	48,013	389,410	60	1,724	1,784	6,474	4,499	10,973	347,931	54,236	402,167
1957	165,438	80,042	245,480	60	1,724	1,784	7,602	5,282	12,884	173,100	87,048	260,148
1958	140,996	156,790	297,786	60	1,724	1,784	9,962	6,923	16,885	151,018	165,437	316,455
1959	238,832	81,302	320,134	60	1,724	1,784	5,268	3,660	8,928	244,160	86,686	330,846
1960	156,168	121,182	277,350	60	1,724	1,784	9,531	6,623	16,154	165,759	129,529	295,288
1961	168,819	19,047	187,866	60	1,724	1,784	7,078	4,918	11,996	175,957	25,689	201,646
1962	207,088	112,901	319,989	60	1,724	1,784	5,015	3,485	8,500	212,163	118,110	330,273
1963	270,419	71,623	342,042	60	1,724	1,784	5,864	4,247	10,111	276,343	77,594	353,937
1964	266,382	75,281	341,663	60	1,724	1,784	5,338	3,865	9,203	271,780	80,870	352,650
1965	182,758	51,495	234,253	60	1,724	1,784	5,388	3,901	9,289	188,206	57,120	245,326
1966	251,135	72,004	323,139	60	1,724	1,784	4,093	2,964	7,057	255,288	76,692	331,980
1967	277,750	56,606	334,356	60	1,724	1,784	2,460	1,782	4,242	280,270	60,112	340,382
1968	156,458	36,238	192,696	60	1,724	1,784	4,127	2,989	7,116	160,645	40,951	201,596
1969	233,340	55,472	288,812	60	1,724	1,784	3,734	2,704	6,438	237,134	59,900	297,034
1970	217,431	40,064	257,495	60	1,724	1,784	3,310	2,959	6,269	220,801	44,747	265,548
1971	210,579	20,387	230,966	60	1,724	1,784	3,502	2,070	5,572	214,141	24,181	238,322
1972	116,810	13,073	129,883	60	1,724	1,784	3,431	2,563	5,994	120,301	17,360	137,661
1973	98,335	25,497	123,832	60	1,724	1,784	5,091	4,121	9,212	103,486	31,342	134,828
1974	114,825	32,810	147,635	60	1,724	1,784	4,597	2,548	7,145	119,482	37,082	156,564
1975	140,638	33,725	174,363	60	1,724	1,784	4,165	2,587	6,752	144,863	38,036	182,899
1976	132,085	32,917	165,002	60	1,724	1,784	7,209	4,747	11,956	139,354	39,388	178,742
1977	126,982	28,161	155,143	60	1,724	1,784	9,899	2,967	12,866	136,941	32,852	169,793
1978	116,190	45,533	161,723	72	2,057	2,129	6,981	9,657	16,638	123,243	57,247	180,490
1979	132,458	28,083	160,541	128	3,492	3,620	8,841	8,703	17,545	141,427	40,278	181,706
1980	132,421	37,105	169,526	215	6,135	6,350	4,022	11,233	15,255	136,658	54,473	191,131
1981	178,394	23,775	202,169	158	4,514	4,672	6,057	16,916	22,974	184,609	45,205	229,815
1982	145,274	21,465	166,739	166	4,715	4,881	8,280	18,647	26,927	153,720	44,827	198,547
1983	50,058	7,831	57,889	166	4,715	4,881	6,759	18,025	24,785	56,983	30,571	87,555
1984	23,922	7,622	31,544	166	4,715	4,881	3,686	22,142	25,829	27,774	34,479	62,254
1985	13,334	5,701	19,035	166	4,715	4,881	2,966	17,819	20,785	16,466	28,235	44,701
1986	21,888	4,046	25,934	166	4,715	4,881	3,725	22,374	26,099	25,779	31,135	56,914
1987	36,350	10,446	46,796	166	4,715	4,881	5,403	32,456	37,859	41,919	47,617	89,536
1988	66,972	27,074	94,046	166	4,715	4,881	5,768	34,647	40,415	72,906	66,436	139,342
1989	56,346	8,958	65,304	166	4,715	4,881	6,133	36,838	42,971	62,645	50,511	113,156
1990	34,402	25,760	60,162	166	4,715	4,881	6,498	39,029	45,526	41,066	69,504	110,569
1991	42,382	10,206	52,588	166	4,715	4,881	6,862	41,220	48,082	49,410	56,141	105,551
1992	43,866	24,802	68,668	166	4,715	4,881	7,227	43,411	50,638	51,259	72,928	124,187
1993	16,401	10,602	27,003	166	4,715	4,881	7,592	45,602	53,194	24,159	60,919	85,078
1994	25,223	36,156	61,379	166	4,715	4,881	8,518	51,166	59,684	33,907	92,037	125,944
1995	34,106	31,661	65,767	166	4,715	4,881	9,462	56,835	66,298	43,734	93,211	136,946
1996	184,856	58,050	242,906	166	4,715	4,881	11,650	69,976	81,626	196,672	132,741	329,413
1997	220,476	43,734	264,210	166	4,715	4,881	10,902	65,484	76,386	231,544	113,933	345,477
1998	251,403	31,221	282,624	166	4,715	4,881	12,723	76,424	89,147	264,292	112,360	376,652
1999	237,783	6,769	244,552	166	4,715	4,881	14,801	88,906	103,707	252,750	100,390	353,140

Table 2. Proportion age composition of 1+ harp seal catches at the Front and Gulf 1984-1999. N indicates the number of samples used to estimate proportions.

	n	1	2	3	4	5	6	7	8	9	10	11	12
1984	222	0.1622	0.3198	0.1486	0.0991	0.0541	0.036	0.0315	0.0135	0.009	0.009	0.018	0.0135
1985	311	0.2508	0.2797	0.1801	0.0836	0.045	0.0322	0.0225	0.0225	0.0096	0.0129	0	0
1986	747	0.2664	0.2182	0.1981	0.0776	0.0361	0.0281	0.0174	0.012	0.0134	0.0067	0.012	0.0107
1987	923	0.1809	0.1679	0.1766	0.1192	0.0585	0.0455	0.026	0.0249	0.0217	0.0173	0.0195	0.0054
1988	591	0.242	0.2386	0.1692	0.1032	0.0508	0.0305	0.0169	0.0186	0.0085	0.0051	0.0034	0.0068
1989	375	0.1627	0.184	0.1467	0.1467	0.1013	0.0533	0.016	0.0107	0.016	0.0053	0.0053	0.0053
1990	278	0.1835	0.1655	0.2086	0.1367	0.0863	0.0432	0.018	0.0036	0.0108	0.0108	0.0144	0.0108
1991	245	0.1796	0.0531	0.102	0.1592	0.151	0.0776	0.0286	0.0163	0.0163	0.0163	0.0327	0.0286
1992	333	0.2673	0.1772	0.0961	0.0931	0.0691	0.0631	0.048	0.018	0.033	0.015	0.012	0.006
1993	684	0.2865	0.1711	0.1155	0.0775	0.0687	0.057	0.038	0.0249	0.0263	0 0132	0.0132	0.0088
1994	607	0.1598	0.1104	0.1318	0.1301	0.0873	0.0675	0.0412	0.0428	0.0297	0.0198	0.0231	0.0115
1995	666	0.2132	0.1547	0.1276	0.0946	0.0991	0.0616	0.0616	0.0255	0.018	0.0105	0.015	0.0105
1996	590	0.2593	0.1881	0.0712	0.0542	0.0475	0.0373	0.0356	0.0237	0.0169	0.0237	0.022	0.0136
1997	592	0.4054	0.1858	0.0625	0.0439	0.0355	0.0287	0.0253	0.0169	0.0118	0.0304	0.022	0.0118
1998	967	0.1944	0.061	0.0641	0.0383	0.0889	0.0765	0.0641	0.0755	0.0527	0.03	0.0445	0.0321
1999		0.2864	0.1450	0.0659	0.0455	0.0573	0.0475	0.0417	0.0387	0.0271	0.0280	0.0295	0.0192

	13	14	15	16	17	18	19	20	21	22	23	24	25
1984	0	0.009	0.009	0.0045	0.0045	0	0	0.0045	0.0135	0	0.0135	0.009	0.018
1985	0.0032	0.0161	0.0096	0.0032	0	0.0032	0.0064	0.0064	0	0	0	0	0.0129
1986	0.004	0.008	0.008	0.0067	0.0013	0.0107	0.0054	0.0094	0.008	0.0054	0.0067	0.0067	0.0228
1987	0.0076	0.0098	0.0119	0.0087	0.0065	0.0054	0.0076	0.0098	0.0054	0.0022	0.0076	0.0065	0.0477
1988	0.0102	0.0051	0.0102	0.0085	0.0068	0.0068	0.0102	0.0118	0	0	0.0017	0.0085	0.0271
1989	0.016	0.008	0.0107	0.0107	0.008	0.0133	0.0053	0.0133	0.0107	0.0187	0.0107	0.008	0.0133
1990	0.0144	0.0036	0.0036	0.0072	0.0036	0.0108	0	0.0144	0	0.0072	0.0108	0	0.0324
1991	0.0286	0.0122	0.0204	0.0041	0.0122	0.0122	0.0082	0.0041	0	0.0041	0	0.0041	0.0286
1992	0.006	0.006	0.003	0.012	0.015	0.009	0.018	0.003	0.003	0	0.006	0.003	0.018
1993	0.0161	0.0044	0.0029	0.0044	0.0058	0.0044	0.0058	0	0.0102	0.0044	0.0029	0.0044	0.0336
1994	0.0165	0.0165	0.0181	0.0082	0.0148	0.0132	0.0082	0.0033	0.0082	0.0066	0.0049	0.0082	0.0181
1995	0.006	0.015	0.015	0.0075	0.009	0.012	0.006	0.009	0.009	0.0015	0.006	0.0015	0.0105
1996	0.0136	0.0169	0.0169	0.0254	0.0254	0.0153	0.0102	0.0102	0.0102	0.0136	0.0085	0.0102	0.0305
1997	0.0186	0.0068	0.0084	0.0118	0.0135	0.0101	0.0068	0.0118	0.0068	0.0051	0.0034	0.0051	0.0118
1998	0.0207	0.0217	0.0155	0.0259	0.0134	0.0165	0.0083	0.0124	0.0114	0.0062	0.0041	0.0062	0.0155
1999	0.0176	0.0151	0.0136	0.0210	0.0174	0.0140	0.0084	0.0115	0.0095	0.0083	0.0053	0.0072	0.0193

Table 3. Estimated age compositions of harp seal catches at the Front and Gulf, 1952-1999.

YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	TOTAL
1952	198,063	5,340	11,758	7,779	5,994	6,856	11,645	8,088	7,914	5,754	6,578	5,618	1,785	1,478	2,182	4,091	1,421	2,233	1,798	984	5,391	873	1	435	1,306	1,743	307,108
1953	197,975	20,602	6,330	5,753	3,744	4,037	3,223	2,825	2,882	2,777	2,330	2,851	1,743	1,370	1,022	1,823	1,989	1,408	906	673	2,541	1,664	937	624	453	404	272,886
1954	175,034	31,645	12,587	3,949	5,625	2,934	3,709	3,329	3,036	2,011	2,908	1,250	2,623	2,533	1,316	1,832	2,196	1,017	337	1,121	831	307	284	718	142	1,142	264,416
1955	252,297	21,800	8,498	6,001	4,321	3,989	3,652	3,113	3,271	2,598	2,942	2,618	2,035	1,555	1,163	2,222	2,080	1,364	739	768	2,374	1,303	779	616	515	756	333,369
1956	341,397	12,068	4,795	3,299	2,629	2,194	2,127	1,909	2,041	1,748	1,838	1,587	1,315	998	848	1,331	1,321	870	578	571	1,505	739	459	389	346	508	389,410
1957	165,438	21,656	7,982	5,330	4,275	3,586	3,464	3,068	3,128	2,684	2,990	2,762	2,080	1,713	1,316	2,309	2,171	1,422	780	826	2,418	1,300	795	611	535	841	245,480
1958	140,996	24,328	9,817	11,311	11,855	10,092	6,589	6,063	5,092	4,813	9,670	5,745	7,088	4,169	3,148	8,813	5,846	2,987	560	1,498	5,374	2,899	2,426	1,007	1,966	3,634	297,786
1959	238,832	21,882	8,185	5,458	4,239	3,788	3,741	3,232	3,247	2,830	3,110	2,695	2,054	1,653	1,280	2,347	2,149	1,422	741	819	2,411	1,299	773	633	526	788	320,134
1960	156,168	32,554	12,672	9,520	6,539	5,561	5,571	4,631	4,505	3,860	4,404	3,896	3,005	2,395	1,784	3,339	3,164	2,046	1,084	1,145	3,568	1,924	1,155	916	779	1,165	277,350
1961	168,819	5,035	1,977	1,951	2,399	810	1,014	1,009	617	586	909	542	310	313	306	154	248	189	99	120	146	0	80	59	9	165	187,866
1962	207,088	29,503	33,876	9,411	8,724	6,173	2,677	2,488	2,568	2,534	1,083	1,242	1,872	966	1,349	1,911	660	1,663	763	578	1,291	159	604	29	152	625	319,989
1963	270,419	9,018	8,102	6,615	3,842	3,014	3,441	3,410	3,360	3,096	3,587	3,450	2,546	2,751	2,770	2,145	2,625	1,794	1,176	924	944	848	628	493	412	632	342,042
1964	266,382	5,685	5,253	5,699	6,561	4,333	6,511	3,375	2,789	2,635	4,106	2,142	2,132	1,643	1,629	2,491	2,014	2,502	3,857	2,010	62	1,953	987	983	1,438	2,491	341,663
1965	182,758	11,710	5,382	4,621	4,901	5,968	5,537	2,094	969	642	1,231	389	1,644	263	1,195	1,029	546	310	671	715	246	464	228	20	29	691	234,253
1966	251,135	13,528	10,652	4,901	4,791	4,987	5,020	4,564	3,091	1,630	1,706	2,224	1,606	1,455	1,631	1,370	1,376	967	1,511	933	1,000	724	299	631	351	1,056	323,139
1967	277,750	14,120	6,348	2,552	2,204	3,117	3,956	3,422	2,406	1,567	1,401	1,790	1,245	984	1,472	1,487	965	1,230	1,344	1,385	898	584	426	482	291	930	334,356
1968	156,458	5,747	4,194	2,800	1,653	1,471	1,504	2,130	2,231	1,524	1,529	1,149	913	854	1,115	950	885	756	1,100	950	677	417	573	299	219	598	192,696
1969	233,340	21,117	2,815	2,859	2,353	2,660	1,963	2,261	2,816	2,056	1,732	1,532	1,013	1,162	1,183	1,229	784	1,265	809	913	757	548	336	411	191	707	288,812
1970	217,431	8,766	7,386	2,580	2,429	2,363	1,363	1,326	1,601	1,437	1,813	1,183	1,129	830	723	866	937	541	538	549	484	350	263	202	133	272	257,495
1971	210,579	7,692	2,568	2,092	1,055	1,047	644	515	446	672	728	464	491	375	168	226	198	139	151	138	90	60	74	46	9	299	230,966
1972	116,810	4,100	2,269	1,319	1,276	601	531	377	309	159	216	248	251	133	211	172	100	121	139	64	195	108	72	45	33	24	129,883
1973	98,335	4,918	3,918	2,755	2,284	3,159	1,051	908	1,023	636	603	725	582	564	415	439	347	211	159	175	180	40	145	18	18	224	123,832
1974	114,825	10,412	5,762	2,137	1,725	1,800	2,671	797	914	1,047	706	492	639	641	445	395	427	371	254	198	103	113	140	76	114	431	147,635
1975	140,638	12,776	6,170	3,106	1,661	1,574	1,437	1,379	787	573	804	505	509	486	346	251	297	215	214	190	86	105	63	68	71	52	174,363
1976	132,085	14,575	7,084	3,923	2,598	888	593	530	544	227	324	315	258	142	179	219	93	105	67	59	64	18	25	41	23	23	165,002
1977	126,982	7,451	5,581	5,131	3,746	1,906	1,062	727	455	192	219	219	154	186	360	385	166	27	38	12	30	15	20	37	22	20	155,143
1978	116,190	15,853	10,031	6,051	4,438	2,963	1,967	647	859	337	578	198	206	222	137	205	109	104	138	70	111	91	79	33	21	85	161,723
1979	132,458	13,686	5,814	2,700	1,668	1,272	789	425	231	217	73	73	79	75	148	153	34	56	55	40	21	21	30	10	11	402	160,541

YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	TOTAL
1980	132,421	14,132	6,565	4,378	2,573	1,994	1,597	1,104	790	555	269	432	413	299	380	345	321	262	27	97	147	81	73	16	10	245	169,526
1981	178,394	5,633	3,077	2,906	2,745	2,421	1,700	1,028	706	295	428	440	310	228	218	221	206	272	183	147	51	166	169	63	29	133	202,169
1982	145,274	7,832	4,229	2,263	1,285	1,428	626	901	363	439	176	297	110	154	99	154	66	198	55	121	121	154	22	77	44	253	166,739
1983	50,058	2,754	1,430	839	447	545	437	275	216	99	135	64	69	33	56	100	48	36	69	40	33	13	3	25	14	51	57,889
1984	23,922	1,236	2,438	1,133	755	412	274	240	103	69	69	137	103	0	69	69	34	34	0	0	34	103	0	103	69	137	31,542
1985	13,334	1,430	1,595	1,027	477	257	184	128	128	55	74	0	0	18	92	55	18	0	18	36	36	0	0	0	0	74	19,034
1986	21,888	1,078	883	802	314	146	114	70	49	54	27	49	43	16	32	32	27	5	43	22	38	32	22	27	27	92	25,933
1987	36,350	1,890	1,754	1,845	1,245	611	475	272	260	227	181	204	56	79	102	124	91	68	56	79	102	56	23	79	68	498	46,797
1988	66,972	6,352	6,460	4,581	2,794	1,375	826	458	504	230	138	92	184	276	138	276	230	184	184	276	319	0	0	46	230	734	94,060
1989	56,346	1,457	1,648	1,314	1,314	907	477	143	96	143	47	47	47	143	72	96	96	72	119	47	119	96	168	96	72	119	65,304
1990	34,402	4,727	4,263	5,374	3,521	2,223	1,113	464	93	278	278	371	278	371	93	93	185	93	278	0	371	0	185	278	0	835	60,167
1991	42,382	1,833	542	1,041	1,625	1,541	792	292	166	166	166	334	292	292	125	208	42	125	125	84	42	0	42	0	42	292	52,589
1992	43,866	6,630	4,395	2,383	2,309	1,714	1,565	1,190	446	818	372	298	149	149	149	74	298	372	223	446	74	74	0	149	74	446	68,666
1993	16,401	3,037	1,814	1,225	822	728	604	403	264	279	140	140	93	171	47	31	47	61	47	61	0	108	47	31	47	356	27,003
1994	25,223	5,778	3,992	4,765	4,704	3,156	2,441	1,490	1,547	1,074	716	835	416	597	597	654	296	535	477	296	119	296	239	177	296	654	61,372
1995	34,106	6,750	4,898	4,040	2,995	3,138	1,950	1,950	807	570	332	475	332	190	475	475	237	285	380	190	285	285	47	190	47	332	65,764
1996	184,856	15,052	10,919	4,133	3,146	2,757	2,165	2,067	1,376	981	1,376	1,277	789	789	981	981	1,474	1,474	888	592	592	592	789	493	592	1,771	242,906
1997	220,476	17,730	8,126	2,733	1,920	1,553	1,2[illegible]	1,106	739	516	1,330	962	516	813	297	367	516	590	442	297	516	297	223	149	223	516	264,210
1998	251,396	5,963	1,871	1,966	1,175	2,727	2,347	1,966	2,316	1,617	920	1,365	985	635	666	475	794	411	506	255	380	350	190	126	190	475	282,067
1999	237,783	1,938	981	446	308	388	322	282	262	184	190	200	130	119	102	92	142	118	95	57	78	64	56	36	49	130	244,552

Table 4 . Proportion age composition of harp seal catches in Greenland (from Bowen 1982 and Kapel 1999).

	0	1	2	3	4	5	6	7	8	9	10	11	12
54-62	0.590	0.160	0.050	0.040	0.030	0.020	0.020	0.010	0.010	0.010	0.010	0.005	0.005
63-69	0.580	0.110	0.070	0.040	0.030	0.030	0.020	0.020	0.010	0.010	0.010	0.007	0.008
1970	0.528	0.064	0.040	0.056	0.032	0.040	0.024	0.032	0.016	0.024	0.024	0.024	0.008
1971	0.629	0.097	0.046	0.069	0.023	0.011	0.011	0.006	0.006	0.017	0.006	0.017	0.011
1972	0.572	0.123	0.080	0.038	0.050	0.024	0.018	0.021	0.004	0.000	0.004	0.003	0.007
1973	0.553	0.216	0.079	0.038	0.011	0.020	0.006	0.005	0.007	0.001	0.005	0.004	0.006
1974	0.643	0.189	0.073	0.007	0.017	0.005	0.010	0.003	0.003	0.002	0.000	0.005	0.007
1975	0.617	0.231	0.071	0.023	0.016	0.003	0.000	0.003	0.003	0.006	0.003	0.003	0.006
1976	0.603	0.223	0.092	0.037	0.017	0.002	0.000	0.000	0.002	0.000	0.002	0.000	0.002
1977	0.769	0.118	0.049	0.019	0.013	0.004	0.001	0.004	0.002	0.001	0.002	0.003	0.003
1978	0.420	0.297	0.109	0.065	0.022	0.018	0.020	0.002	0.008	0.003	0.003	0.003	0.004
1979	0.504	0.201	0.123	0.058	0.024	0.012	0.014	0.009	0.007	0.005	0.003	0.001	0.002
1980	0.264	0.345	0.152	0.095	0.041	0.022	0.013	0.007	0.009	0.005	0.003	0.005	0.003
1981	0.264	0.345	0.152	0.095	0.041	0.022	0.013	0.007	0.009	0.005	0.003	0.005	0.003
1982	0.308	0.275	0.160	0.093	0.043	0.023	0.015	0.008	0.010	0.018	0.013	0.008	0.003
1983	0.273	0.292	0.127	0.094	0.073	0.025	0.025	0.022	0.006	0.013	0.009	0.007	0.006
1984-99	0.143	0.177	0.150	0.146	0.083	0.058	0.044	0.033	0.028	0.012	0.011	0.011	0.004

	13	14	15	16	17	18	19	20	21	22	23	24	25+
54-62	0.003	0.004	0.007	0.003	0.004	0.003	0.003	0.004	0.002	0.002	0.002	0.002	0.002
63-69	0.004	0.005	0.010	0.004	0.005	0.004	0.004	0.006	0.003	0.002	0.002	0.002	0.003
1970	0.016	0.008	0.000	0.000	0.000	0.000	0.000	0.016	0.008	0.008	0.008	0.008	0.016
1971	0.000	0.017	0.006	0.000	0.006	0.006	0.000	0.000	0.006	0.006	0.000	0.000	0.006
1972	0.003	0.001	0.004	0.003	0.001	0.006	0.004	0.003	0.003	0.003	0.003	0.003	0.016
1973	0.006	0.002	0.000	0.007	0.005	0.004	0.004	0.005	0.002	0.002	0.002	0.002	0.005
1974	0.003	0.007	0.002	0.005	0.003	0.000	0.005	0.003	0.002	0.002	0.002	0.002	0.002
1975	0.000	0.003	0.003	0.000	0.000	0.000	0.000	0.003	0.003	0.000	0.000	0.000	0.000
1976	0.002	0.002	0.002	0.005	0.002	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000
1977	0.001	0.000	0.000	0.002	0.002	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.002
1978	0.003	0.003	0.002	0.002	0.001	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.008
1979	0.001	0.003	0.001	0.004	0.004	0.001	0.003	0.002	0.004	0.003	0.003	0.002	0.005
1980	0.003	0.001	0.003	0.002	0.000	0.001	0.003	0.003	0.002	0.002	0.002	0.002	0.011
1981	0.003	0.001	0.003	0.002	0.000	0.001	0.003	0.003	0.002	0.002	0.002	0.002	0.011
1982	0.005	0.000	0.003	0.003	0.000	0.003	0.003	0.003	0.003	0.003	0.003	0.000	0.003
1983	0.003	0.001	0.003	0.004	0.004	0.001	0.003	0.001	0.001	0.000	0.000	0.000	0.003
1984-99	0.009	0.005	0.010	0.009	0.008	0.009	0.007	0.009	0.007	0.007	0.006	0.005	0.007

Table 5. Estimated age compositions of harp seal catches in Greenland, 1952-1999.

YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	TOTAL
1952	9,676	2,624	820	656	492	328	328	164	164	164	164	85	88	53	62	113	53	59	43	47	71	34	28	25	28	31	16,400
1953	9,676	2,624	820	656	492	328	328	164	164	164	164	85	88	53	62	113	53	59	43	47	71	34	28	25	28	31	16,400
1954	11,299	3,064	958	766	575	383	383	192	192	192	192	100	103	62	72	132	62	69	51	54	83	40	33	29	33	36	19,150
1955	9,165	2,485	777	621	466	311	311	155	155	155	155	81	84	50	59	107	50	56	41	44	68	32	26	23	26	29	15,534
1956	6,474	1,756	549	439	329	219	219	110	110	110	110	57	59	35	41	76	35	39	29	31	48	23	19	17	19	21	10,973
1957	7,602	2,061	644	515	387	258	258	129	129	129	129	67	69	41	49	89	41	46	34	37	56	27	22	19	22	24	12,884
1958	9,962	2,702	844	675	507	338	338	169	169	169	169	88	91	54	64	117	54	61	45	48	73	35	29	26	29	32	16,885
1959	5,268	1,428	446	357	268	179	179	89	89	89	89	46	48	29	34	62	29	32	24	25	39	19	15	14	15	17	8,928
1960	9,531	2,585	808	646	485	323	323	162	162	162	162	84	87	52	61	111	52	58	43	46	70	34	27	24	27	31	16,154
1961	7,078	1,919	600	480	360	240	240	120	120	120	120	62	65	39	45	83	39	43	32	34	52	25	20	18	20	23	11,996
1962	5,015	1,360	425	340	255	170	170	85	85	85	85	44	46	27	32	59	27	31	22	24	37	18	14	13	14	16	8,500
1963	5,864	1,112	708	404	303	303	202	202	101	101	101	74	76	45	54	98	45	51	37	40	62	29	24	21	24	27	10,111
1964	5,338	1,012	644	368	276	276	184	184	92	92	92	67	69	41	49	89	41	46	34	37	56	27	22	19	22	24	9,203
1965	5,388	1,022	650	372	279	279	186	186	93	93	93	68	70	42	49	90	42	47	34	37	57	27	22	20	22	25	9,289
1966	4,093	776	494	282	212	212	141	141	71	71	71	51	53	32	37	68	32	35	26	28	43	21	17	15	17	19	7,057
1967	2,460	467	297	170	127	127	85	85	42	42	42	31	32	19	22	41	19	21	16	17	26	12	10	9	10	11	4,242
1968	4,127	783	498	285	213	213	142	142	71	71	71	52	54	32	38	69	32	36	26	28	43	21	17	15	17	19	7,116
1969	3,734	708	451	258	193	193	129	129	64	64	64	47	49	29	34	62	29	32	24	26	39	19	15	14	15	17	6,438
1970	3,310	401	251	351	201	251	150	201	100	150	150	150	50	100	50	0	0	0	0	0	100	50	50	50	50	100	6,269
1971	3,502	541	255	382	127	64	64	32	32	96	32	96	64	0	96	32	0	32	32	0	0	32	32	0	0	32	5,572
1972	3,431	736	479	231	301	142	106	124	27	0	27	18	44	18	9	27	18	9	35	27	18	18	18	18	18	98	5,994
1973	5,091	1,986	731	354	103	183	57	46	68	11	46	34	57	57	23	0	68	46	34	34	46	23	23	23	23	46	9,212
1974	4,597	1,351	521	47	118	36	71	24	24	12	0	36	47	24	47	12	36	24	0	36	24	12	12	12	12	12	7,145
1975	4,165	1,556	482	153	110	22	0	22	22	44	22	22	44	0	22	22	0	0	0	0	22	22	0	0	0	0	6,752
1976	7,209	2,670	1,098	445	208	30	0	0	30	0	30	0	30	30	30	30	59	30	0	0	0	30	0	0	0	0	11,956
1977	9,899	1,512	628	242	171	57	14	57	29	14	29	43	43	14	0	0	29	29	0	0	0	14	14	0	0	29	12,866
1978	6,981	4,941	1,815	1,085	374	299	337	37	131	56	56	56	75	56	56	37	37	19	0	0	0	19	19	19	0	131	16,638
1979	8,842	3,534	2,163	1,019	428	214	239	151	126	88	50	25	38	25	50	25	63	63	25	50	38	63	50	50	38	88	17,545

YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	TOTAL
1980	4,022	5,256	2,324	1,442	625	337	192	112	144	80	48	80	48	48	16	48	32	0	16	48	48	32	32	32	32	160	15,255
1981	6,057	7,915	3,499	2,172	941	507	290	169	217	121	72	121	72	72	24	72	48	0	24	72	72	48	48	48	48	241	22,974
1982	8,280	7,405	4,308	2,491	1,144	606	404	202	269	471	337	202	67	135	0	67	67	0	67	67	67	67	67	67	0	67	26,927
1983	6,760	7,240	3,140	2,327	1,810	628	628	554	148	332	222	185	148	74	37	74	111	111	37	74	37	37	0	0	0	74	24,785
1984	3,686	4,578	3,869	3,780	2,150	1,487	1,125	850	732	308	293	291	115	228	128	261	242	211	227	193	224	193	177	160	128	192	25,829
1985	2,966	3,684	3,113	3,042	1,730	1,197	905	684	589	248	236	235	92	183	103	210	194	170	182	156	180	156	142	129	103	154	20,785
1986	3,725	4,626	3,909	3,819	2,173	1,503	1,137	859	740	311	296	294	116	230	130	264	244	214	229	195	226	195	179	162	130	194	26,099
1987	5,403	6,711	5,671	5,540	3,151	2,180	1,649	1,246	1,073	452	429	427	168	334	188	383	354	310	332	283	328	283	259	235	188	281	37,859
1988	5,768	7,164	6,054	5,914	3,364	2,327	1,760	1,330	1,146	482	458	456	180	357	201	409	378	331	354	302	350	302	277	251	201	300	40,415
1989	6,133	7,617	6,437	6,288	3,577	2,474	1,871	1,414	1,218	512	487	485	191	379	214	435	402	352	377	322	372	322	294	266	214	319	42,971
1990	6,498	8,070	6,819	6,662	3,790	2,621	1,983	1,498	1,291	543	516	514	202	402	226	460	426	373	399	341	394	341	311	282	226	338	45,526
1991	6,862	8,523	7,202	7,036	4,002	2,768	2,094	1,582	1,363	573	545	543	214	424	239	486	450	394	422	360	416	360	329	298	239	357	48,082
1992	7,227	8,976	7,585	7,410	4,215	2,915	2,205	1,666	1,436	604	574	571	225	447	252	512	474	414	444	379	438	379	346	314	252	376	50,638
1993	7,592	9,429	7,968	7,784	4,428	3,063	2,317	1,750	1,508	634	603	600	236	470	264	538	498	435	467	398	460	398	364	330	264	395	53,194
1994	8,518	10,579	8,940	8,734	4,968	3,436	2,599	1,964	1,692	712	677	673	265	527	297	604	558	488	523	447	517	447	408	370	297	443	59,684
1995	9,462	11,752	9,931	9,701	5,519	3,817	2,887	2,182	1,880	791	752	748	294	585	330	670	620	543	581	496	574	496	454	411	330	492	66,298
1996	11,650	14,469	12,227	11,944	6,795	4,699	3,555	2,686	2,314	974	926	921	363	720	406	825	764	668	716	611	707	611	558	506	406	606	81,626
1997	10,902	13,540	11,442	11,178	6,358	4,398	3,327	2,514	2,166	911	866	862	339	674	380	772	715	625	670	572	661	572	523	474	380	567	76,386
1998	12,723	15,802	13,353	13,045	7,421	5,133	3,882	2,934	2,527	1,063	1,011	1,006	396	787	443	901	834	730	782	667	772	667	610	553	443	662	89,147
1999	14,801	18,383	15,534	15,176	8,633	5,971	4,516	3,413	2,940	1,237	1,176	1,170	461	915	516	1,049	970	849	910	776	898	776	710	643	516	770	103,707

Table 6. Proportion age composition of harp seal catches in the Canadian Arctic (from Bowen 1982).

0	1	2	3	4	5	6	7	8	9	10	11	12
0.034	0.066	0.119	0.132	0.090	0.053	0.049	0.052	0.038	0.027	0.044	0.031	0.032

13	14	15	16	17	18	19	20	21	22	23	24	25+
0.019	0.022	0.041	0.019	0.021	0.016	0.017	0.026	0.012	0.010	0.009	0.010	0.011

Table 7. Estimated age compositions of harp seal catches in the Canadian Arctic, 1952-1999.

YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	TOTAL
1952	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1953	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1954	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1955	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1956	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1957	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1958	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1959	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1960	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1961	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1962	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1963	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1964	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1965	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1966	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
1967	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
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1970	60	117	212	236	160	95	87	93	67	49	79	55	57	34	40	73	34	38	28	30	46	22	18	16	18	20	1,784
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1978	72	140	253	282	191	113	104	111	80	58	94	66	68	41	48	87	41	45	33	36	55	26	21	19	21	24	2,129
1979	122	237	430	479	325	193	177	189	136	99	160	112	116	69	81	148	69	77	57	61	93	45	37	32	37	41	3,620
1980	214	416	755	840	570	338	310	331	238	174	281	196	203	121	142	260	121	135	100	107	164	78	64	57	64	71	6,350
1981	157	306	555	618	419	249	228	244	175	128	207	144	149	89	105	191	89	100	73	79	120	58	47	42	47	52	4,672
1982	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1983	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
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1997	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
1998	164	320	580	646	438	260	238	255	183	134	216	150	156	93	109	200	93	104	77	82	126	60	49	44	49	55	4,881
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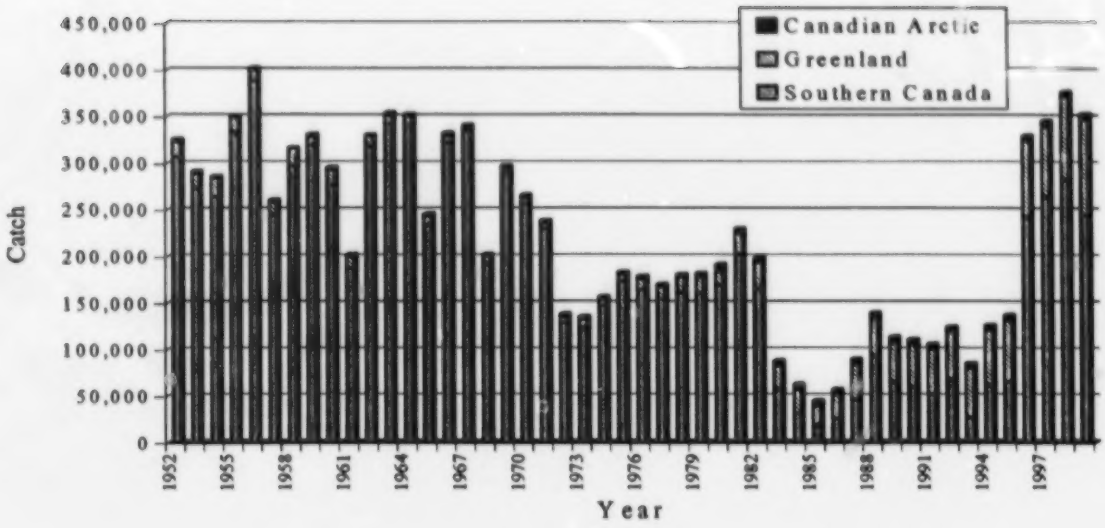

Fig 1. Total reported catches of harp seals in the Northwest Atlantic 1952-99.

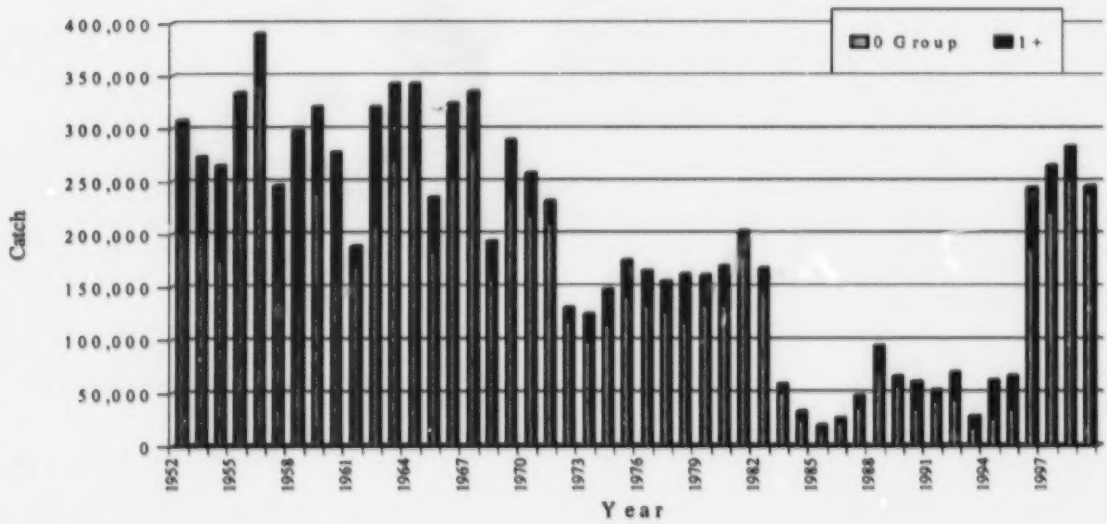

Fig 2. Catches of harp seals in southern Canadian (Front and Gulf) areas 1952-1999.

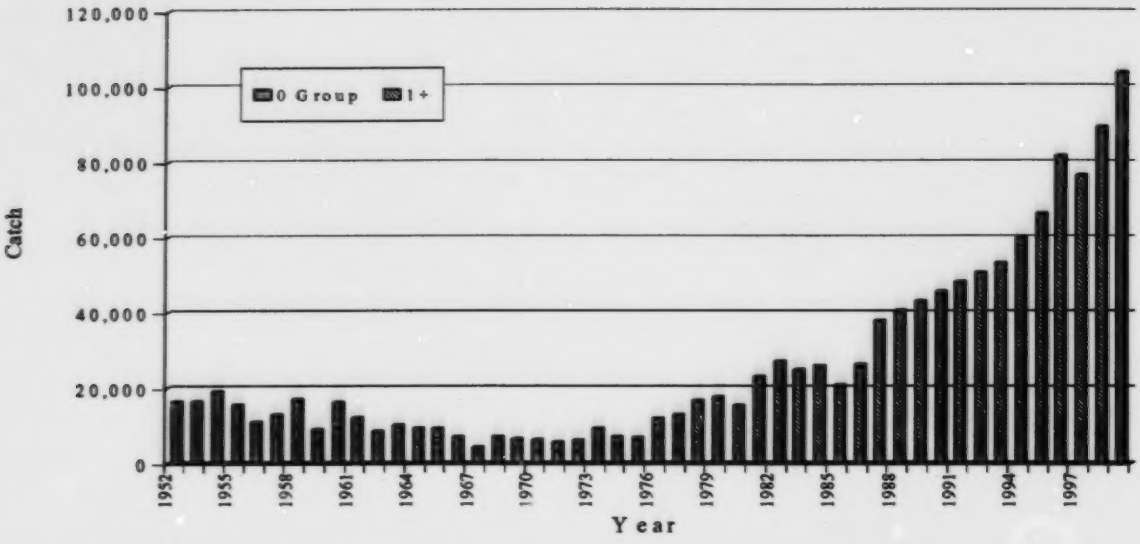

Fig. 3. Catches of Northwest Atlantic harp seals in Greenland waters 1952-1999. Values for 1952, 1988-92 and 1999 are estimated (see text).

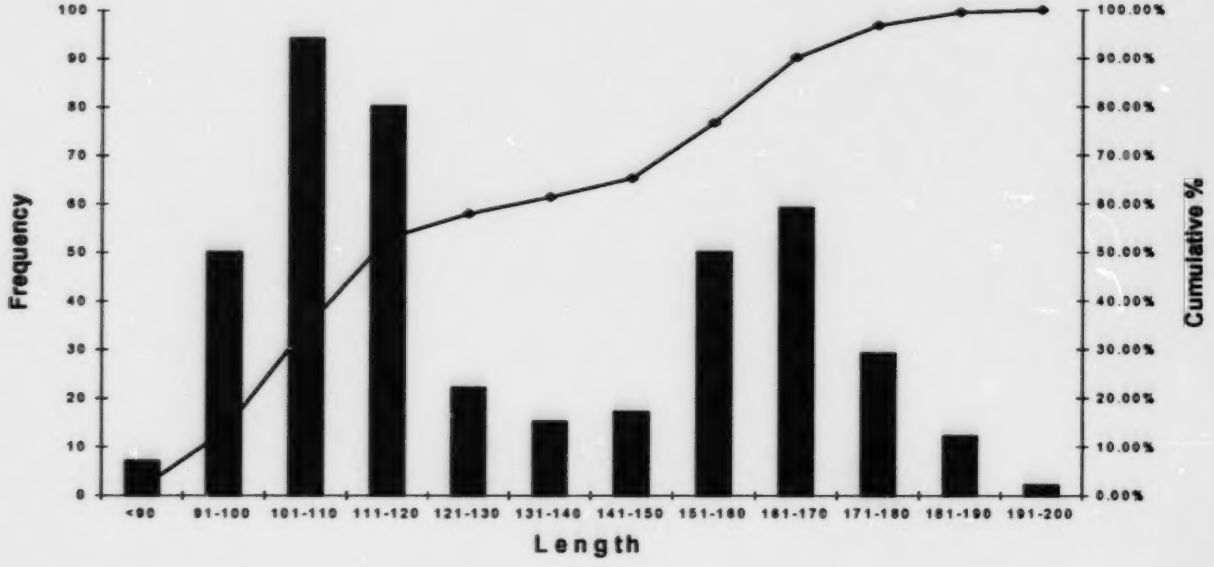

Fig 4. Length of harp seals taken in Greenland 1997-99. Unpublished data from A. Rosing-Asvid, Greenland Institute of Natural Resources, Nuuk, Greenland.